

AMENDMENTS TO THE CLAIMS:

The following listing of claims replaces all prior versions and listings of claims in this application.

LISTING OF CLAIMS:

1-13. (Canceled)

14. (Currently Amended) A pattern-detection apparatus that detects a specific pattern contained in an image, said pattern-detection apparatus comprising:

a binarizing unit that binarizes an input image data to obtain binary image data,

a partial-image recognition unit that recognizes a partial image being contained in said binary image data and being part of said specific pattern, and

a specific pattern determination unit that determines said specific pattern contained in said image, based on the recognition results obtained by said partial-image recognition unit,

wherein said partial-image recognition unit recognizes a partial image contained in said binary image data, for a pixel-block area having a predetermined size and containing a target pixel in said binary image data, based on at least two ~~one~~ of: conditions concerning the pixels at opposite vertices, conditions concerning pixels on outermost lines of said pixel-block area, and conditions concerning pixels on opposite sides on the outermost lines of said pixel-block area.

15. (Original) The pattern-detection apparatus of claim 14, wherein said partial image is approximately a circular image.

16. (Currently Amended) ~~The pattern-detection apparatus of claim 14, A~~
pattern-detection apparatus that detects a specific pattern contained in an image,
said pattern-detection apparatus comprising:

a binarizing unit that binarizes an input image data to obtain binary image
data,

a partial-image recognition unit that recognizes a partial image being
contained in said binary image data and being part of said specific pattern, and

a specific pattern determination unit that determines said specific pattern
contained in said image, based on the recognition results obtained by said partial-
image recognition unit,

wherein said partial-image recognition unit recognizes a partial image
contained in said binary image data, for a pixel-block area having a predetermined
size and containing a target pixel in said binary image data, based on one or more
of: conditions concerning the pixels at opposite vertices, conditions concerning pixels
on outermost lines of said pixel-block area, or conditions concerning pixels on
opposite sides on the outermost lines of said pixel-block area;

~~wherein said condition~~ conditions concerning the pixels on the outermost lines
for the partial-image recognition in said partial-image recognition unit is ~~the one~~ that
the number of OFF-pixels in each pixel pair that is located at opposite vertices is less
than 2.

17. (Currently Amended) ~~The pattern-detection apparatus of claim 14, A~~
pattern-detection apparatus that detects a specific pattern contained in an image,
said pattern-detection apparatus comprising:

a binarizing unit that binarizes an input image data to obtain binary image
data,

a partial-image recognition unit that recognizes a partial image being
contained in said binary image data and being part of said specific pattern, and

a specific pattern determination unit that determines said specific pattern
contained in said image, based on the recognition results obtained by said partial-
image recognition unit,

wherein said partial-image recognition unit recognizes a partial image
contained in said binary image data, for a pixel-block area having a predetermined
size and containing a target pixel in said binary image data, based on one or more
of: conditions concerning the pixels at opposite vertices, conditions concerning pixels
on outermost lines of said pixel-block area, or conditions concerning pixels on
opposite sides on the outermost lines of said pixel-block area;

~~wherein said condition~~ conditions concerning the pixels on opposite sides on
the outermost lines for the partial-image recognition in said partial-image recognition
 unit ~~is the one that~~ the total number of ON-pixels on the outermost lines is not more
 than a predetermined number, for the pixels on the outermost lines of said pixel-
 block area.

18. (Currently Amended) ~~The pattern-detection apparatus of claim 14, A~~
pattern-detection apparatus that detects a specific pattern contained in an image,
said pattern-detection apparatus comprising:

a binarizing unit that binarizes an input image data to obtain binary image
data,

a partial-image recognition unit that recognizes a partial image being
contained in said binary image data and being part of said specific pattern, and

a specific pattern determination unit that determines said specific pattern
contained in said image, based on the recognition results obtained by said partial-
image recognition unit,

wherein said partial-image recognition unit recognizes a partial image
contained in said binary image data, for a pixel-block area having a predetermined
size and containing a target pixel in said binary image data, based on one or more
of: conditions concerning the pixels at opposite vertices, conditions concerning pixels
on outermost lines of said pixel-block area, or conditions concerning pixels on
opposite sides on the outermost lines of said pixel-block area;

wherein said ~~condition~~ conditions concerning the pixels on the opposite sides
on the outermost lines for the partial-image recognition in said partial-image
 recognition unit is ~~the one~~ that the total number of ON-pixels on the outermost lines
 is not more than a predetermined number, for the pixels on the opposite sides on the
 outermost lines of said pixel-block area.

19. (Original) The pattern-detection apparatus of claim 14 having further a
 low-resolution conversion unit that converts said binary image data obtained by said

binarizing unit to binary image data of lower resolution, and said partial-image recognition unit recognizing a partial image for said binary image data converted to lower-resolution image data by said low-resolution conversion unit.

20. (Currently Amended) A method for detecting a specific pattern contained in an image, said pattern-detection method comprising steps of:

binarizing input image data to obtain binary image data,

recognizing a partial image that is contained in said binary image data, and that is part of said specific pattern and has an empty inside, and

determining said specific pattern contained in said image, based on the recognition results,

said method being characterized in that in the partial-image recognition step, said partial image contained in said binary image data is recognized, for a pixel-block area having predetermined size and containing a target pixel in said binary image data, based on at least two ~~one~~ of: conditions concerning pixels at the opposite vertices, conditions concerning pixels on outermost lines of said pixel-block area, and conditions concerning pixels on opposite sides on the outermost lines of said pixel-block area.

21. (Currently Amended) A computer-readable storage medium that stores a pattern-detection program for detecting a specific pattern contained in an image, said pattern-detection program comprising the steps of:

binarizing input image data to obtain binary image data,

recognizing a partial image that is contained in the binary image data and is part of the specific pattern, and

determining the specific pattern contained in the image based on the recognition results,

wherein in the partial-image recognition step, a partial image contained in said binary image data is recognized, for a pixel-block area having predetermined size and containing a target pixel in said binary image data, based on at least two ~~one~~ of: conditions concerning the pixels at opposite vertices, conditions concerning pixels on outermost lines of said pixel-block area, and conditions concerning pixels on opposite sides on the outermost lines of said pixel-block area.

22. (Previously Presented) The pattern detection apparatus of claim 14, wherein the conditions concerning the pixels are the binary values of the pixels.

23. (Previously Presented) The method of claim 20, wherein the conditions concerning the pixels are the binary values of the pixels.

24. (Previously Presented) The computer-readable storage medium that stores a pattern-detection program for detecting a specified pattern contained in an image, of claim 21, wherein the conditions concerning the pixels are the binary values of the pixels.

25. (Canceled)

26. (Canceled)

27. (Canceled)